MURRAY STATE UNIVERSITY

Steeplechase: An ORCA Student Journal

Volume 4
Issue 2 *Spring 2021*

Article 2

2020

A Survey of Horse Use and Management in Horse Clubs in China: a Pilot Study

Zhen Li Ph.D., MSc

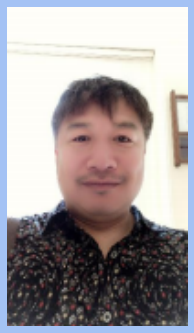
Shea Porr PhD
Murray State University

STEEPLECHASE

ORCA Student Journal
Research Snapshot

About the Author

Zhen Li, Ph.D., MSc in Agriculture, Equine Science, Class of 2019



Zhen Li, Ph.D., is an Associate Professor and supervisor of the Equine Science major at Qingdao Agricultural University (QAU) in Qingdao, China. He received his Ph.D. in 2002 from Shanxi Agricultural University, where he focused on animal breeding and genetics. In 2014, as an academic advisor at Murray State University, he developed friendships with faculty members there. He returned to start his graduate program in Equine Science in 2018, and received his Master's degree in May of 2019. After graduation, he returned to QAU and took on the responsibility of supervising the Equine Science program. In July, 2019, he was appointed as the Under Secretary General of the Equine Science branch of the Chinese Animal Science and Veterinary Association. While teaching and researching are his major duties, he is enthusiastic about helping the Chinese horse industry build collaborations with foreign resources and in promoting a dual degree program in Equine Science which will be run by QAU and Murray State.

C.A. Shea Porr, PAS, Ph.D., Associate Professor

C.A. Shea Porr, PAS, Ph.D. is an Associate Professor and the Department Head of Murray State University's Animal/Equine Science Department, Dr. Porr teaches courses and advises undergraduate and master's students, guides the animal/equine science program, and oversees the farms and facilities. She is also the Racer 1 Faculty Coordinator and a co-advisor of the MSU Horsemen's Association. Dr. Porr received degrees from Texas A&M University, the University of Florida, and Virginia Tech. Her research focus in graduate school was on nutrition and exercise effects on bone development in horses. She has held several positions in both academia and industry, including working for the Ohio State University, Buckeye Nutrition, and Virginia Tech before joining Murray State University. In addition to her other duties, Dr. Porr supports the horse industry through presentations at various professional and industry meetings. While her research topics vary, she is particularly interested in education in emergency response and preparedness with horses in mind.

A Survey of Horse Use and Management in Horse Clubs in China: a Pilot Study

Zhen Li, Ph.D., C.A. Shea Porr, PAS, Ph.D.

Abstract

Rapid development of the Chinese equine industry in the last two decades has resulted in an increased equine population without trained personnel to support industry growth. The purpose of this study was to understand the present profile of horse use in horse clubs in China from the perspective of horse welfare. The survey was distributed to specific personnel in selected Chinese horse clubs, and snowball sampling techniques were used to increase response rates. Of 20 respondents, the oldest club was established in 2002 and the newest in 2018. Fourteen clubs were membership-based, providing services for 40-1000 members and up to 10,000 visitors annually. A total of 1703 horses were reported. Most horses were under 15 yr of age (84.6%). Warmbloods made up the greatest number of imported breeds (30.8%), followed by Thoroughbreds (17.9%). Mongolian horses were the most common indigenous breed (29.4%). Major health problems included hoof-related issues (31.6%) and injuries (31.6%). Four clubs (20%) reported no turnout space, and only 5 clubs (25%) had access to turnout areas with grass. Hay constituted the majority of feed for horses. Most horses were used for recreation (20.45%), breeding (17.46%), or dressage (15.25%). Veterinary (23.8%), farrier (19.1%), and nutritionist (17.5%) skills were most needed. Although 38.8% of employees reportedly held a certificate or degree associated with equine science, foreign specialists were often employed to support club activities, including teaching general riding (42.9%) and dressage (21.4%). Horses were used between 4-7 d/wk, and about one-third of clubs (36.7%) reported having a single person in charge to prevent overuse of horses. Data from this study can serve as a platform for future surveys and begin development of education and training programs to improve horse management in China.

Keywords: Chinese horse industry, horse welfare, horse use

A Survey on Horse Use and Management in Horse Clubs in China: A Pilot Study

Literature Review

Since the foundation of the People's Republic of China in 1949, the Chinese horse industry has been working to transition into more modern practices. In the 1960s, breed improvement programs were implemented to foster development of new horse breeds. These new breeds were examined by the government for approval. Many newly developed breeds were used in the agricultural areas of northern China, and in pasturing areas throughout China. Unfortunately, management and supervision of the program eventually decreased, resulting in the loss of some of the new breeds. Approximately 30 years ago, the Chinese equine industry was nearly non-existent (Vorgers, 2017). In 1990, commercial horse races were held for the first time and increasing demand for racing, leisure riding, and other equestrian sports brought about changes in the use of horses. Breeding programs were rebuilt, and more modern breeding techniques were implemented (van Moorsel, 2010).

In China, nearly any equine or equestrian operation would be called a horse club. This could include riding, racing, or breeding operations. The Chinese horse industry has integrated many elements of national culture, heritage protection, medical and health work, sports and recreation, tourism, and agricultural production (Qiao, 2016). At present, only a few equestrian clubs, such as Shanghai Equestrian Stadium, are state-owned. Most equestrian clubs in China are privately-owned and invested in by industrialists. Due to the technical, capital, and business promotion threshold, the management level of most clubs is relatively uneducated, and the investment income level is generally low. Most of the investment is guided by the investors' personal equestrian hobbies, with a lack of rigorous and scientific planning and normative guidance (Sun et al., 2013). A 2019 annual report on the state of Chinese equestrian development suggested most Chinese horse clubs operated off annual membership fees, horse foster care, course fees, and horse gear sales (Equestrian Magazine, 2019), and other research has suggested that general understanding of equine welfare may be lacking (Zhang, 2019).

In response to market demands, horses are no longer merely used for traditional purposes. Xinjiang is the main horse-producing area in China, and in 1999 there were 750,000 horses in that region. In Xinjiang, horse products such as conjugated estrogens, pregnant mare serum gonadotropin (PMSG), refined horse fat, horse meat, and horse milk have developed rapidly (Yao et al., 2007). A 1500% increase in the number of horse clubs was seen between 2010 and 2017, and today the country has over 1800 horse clubs (Horsemanship Magazine, 2018; Equestrian Magazine, 2019). Although dressage is currently a common activity, Wang (2005) suggested that the Chinese equestrian industry has the potential to develop many more areas including racing, various riding and competitive disciplines, and equine education. Indeed, since 2009, the equestrian use of horses

has increased. Horses have been used for both professional and amateur purposes. Competing in show jumping and other equestrian sports has become a primary goal for many in the Chinese horse industry (van Moorsel, 2010). It seems likely this trend will continually develop towards an increasing resemblance of the Western European forms of horse use (Mang, 2009).

Whilst the Chinese horse industry is growing rapidly in size, other aspects have not yet been developed to match international standards (Vorgers, 2017; Equestrian Magazine, 2019, Zhang, 2019). In particular, the rapid development of the Chinese horse industry has resulted in many challenges relative to horse use and welfare during a time when animal welfare is a hot topic around the world (Zhang, 2019; Equestrian Magazine, 2019). The purpose of this study was to understand the present profile of horse use in horse clubs in China from the perspective of horse welfare. It is expected to provide a reference for the Chinese horse industry and motivate those involved to continue to improve equine health care and management practices.

Methodology

Design

The survey design involved an online (SurveyMonkey ©), respondent-friendly questionnaire that was intended to be easy to understand and relatively short (Dillman et al., 2014). Twenty-nine questions were developed with consideration of information needed to establish a baseline of horse use and welfare in China (Table 1). Demographics included information on club history and management as well as data on horses owned by the club. Other sections included horse use and management practices.

Table 1. Survey questions used to gather information on horse use and management in Chinese horse clubs. Survey was distributed in Chinese but translated to English for this table. Translation was based on the intent of the question.

Question	Response Format
1. Your unit location and website/WeChat/Public Number a. North b. South c. East d. Middle e. Southwest f. Northwest g. Northeast	Single selection for location Open-ended for contact option
2. When was your club established?	Numeric
3. How many horses are there in your club(s) with ages indicated. a. Less than 5 years b. 6-10 years c. 11-15 years d. 16-20 years e. Over 20 years	Open-ended with number requested
4. How old is the oldest horse in your club?	Numeric
5. How many turnouts/paddocks do you have with grass? Without grass? How large is each? a. With grass b. Without grass	Open-ended with number requested size
6. How long (hours) are horses turned out of a stall?	Numeric
7. How many days in a week are horses turned out of a stall?	Numeric
8. What imported breeds are in your club? How many of each breed? Where are they from? a. A b. B c. C d. D	Open-ended with separate entries allowing listing of multiple breeds and accompanying information
9. What Chinese horse breeds do you have? How many of each breed? a. A b. B c. C d. D	Open-ended with separate entries allowing listing of multiple breeds and accompanying information
10. Goal of use for horses. a. Breeding b. Competing c. Barrel d. Jumping e. Dressage f. Endurance g. Lessons h. Recreation i. Retired j. Other (explain)	Multiple-selection requesting number per category, Open-ended for F%"Other"
11. What skills are most needed at this time? Select all that apply. a. Veterinary b. Farrier c. Training (horse) d. Coaching (people) e. Stable manager f. Nutritionist g. Rider h. Other (explain)	Multiple selection, Open-ended for "Other"
12. How do you use employees as follows? a. Vet (Full time) b. Vet (Part time) c. Farrier (Full time) d. Farrier (Part time) e. Dentist (Full time) f. Dentist (Part time)	Multiple-selection
13. What percentage of riders do you have with certificates or degrees associated with equine science?	Numeric
14. In the past year, relative to foreign employees, list the number hired in each time frame. a. Up to 3 months b. 3-6 months c. 6-12 months d. Over 12 months	Numeric
15. If you hired foreign employees, what was their nationality? a. A b. B c. C	Open-ended with separate entries allowing listing of multiple employees and accompanying information
16. What were the foreign employee duties? Select all that apply. a. Dressage b. Polo c. Western Pleasure d. Teach hoof care e. Teach nutrition f. Teach dental care g. Breeding h. Teach riding	Multiple-selection
17. How many events will you take horses to each year?	Open-ended, numeric
18. How many customers do you serve in a typical year? a. Number of members b. Number of visitors	Numeric
19. What are the major health issues your horses have? a. Injury (cuts, kicks, strains, etc.) b. Hoof issues (abscess, cracks, etc.) c. Colic d. Horses too thin e. Other (explain)	Multiple-selection, Open-ended for "Other"
20. Horse feeds a. What kinds of forage (pasture, hay, etc.) do you feed your horses? b. How much forage do you feed each day? c. How often do you feed forage each day?	Open-ended
21. Concentrates (grain mix) a. What kind of concentrate do you feed your horses? b. How much do you feed each day? c. How often do you feed concentrate each day?	Open-ended
22. Supplements a. What kinds of supplements do you feed your horses? b. Why do you use these supplements?	Open-ended
23. What is the most common reason for a horse to leave your club?	Open-ended
24. Use a. What months are your horses used most often? b. How many days a week are they used? c. How many horses are used in a day?	Open-ended
25. How do you track horse use in your club? Select all that apply. a. Daily logs/schedules b. Verbal communication c. Other (explain)	Multiple-selection, Open-ended for "Other"
26. How do you prevent overuse of horses in your club? Select all that apply. a. Daily logs/schedules b. Verbal communication c. Single person in charge of horse assignments d. No such situation e. Other (explain)	Multiple-selection, Open-ended for "Other"
27. On average, what percentage of non-employee riders fall into the following categories relative to their riding or horse handling experience? a. Little to None (less than 1 year) b. Some (1-3 years) c. Moderate (3-5 years) d. A Lot (5-10 years) e. Very Experienced (10+ years)	Multiple open-ended with number requested
28. Based on equine personalities or training, what percentage of horses are considered appropriate for riders as listed? a. Beginners (0-3 years' experience) b. Intermediate (3-8 years' experience) c. Advanced (8+ years' experience)	Multiple open-ended with number requested
29. What percentage of mature horses in your club wear horse shoes? a. No Shoes b. Front Shoes Only c. Front and Rear Shoes	Multiple open-ended with number requested

Instrument Reliability and Validity

Validity and reliability of this instrument were established by submitting the survey to a test group of three Chinese horse clubs. Revisions were made based on responses and feedback from each club. Pre-test results showed that the time needed for finishing this questionnaire was approximately 20 to 40 min for a horse club manager.

Participant Selection and Data Collection

Based on cultural differences and issues with translation, the survey was not simply delivered to Chinese horse clubs. As such, participants were initially selected from horse clubs that the primary investigator (PI) could reach by phone, email, WeChat, or through personal contacts. Associates of the PI who were in China were asked to approach horse clubs directly during this time and encourage responses as well. As such, the total number of horse clubs that received the survey link is not known. The instrument was administered using SurveyMonkey® from November 2018 to January 2019. Participants were allowed 8 wk to respond, and reminders were given every 2 wk to encourage response.

Data Evaluation

After the collection period, responses were downloaded into an Excel spreadsheet. Some responses were confusing, likely based on translation and lack of understanding of concepts expressed using industry terms common in Western countries. Responses considered inappropriate for the question or those that simply did not make sense were not used in data evaluation. Descriptive statistics were utilized to quantify and characterize data within the categories of demographic, horse use, and horse management information.

Results and Discussion

There is very little information published in peer-reviewed journals related to the Chinese horse industry. It should be noted that data from this survey were compared with both peer-reviewed as well as lay publications. It must also be noted that Chinese culture is such that a randomly distributed survey link would likely not gain many responses, as relationships between people are very important. As such, the distribution of the survey through contacts known to the PI may have biased the distribution of responses, although it allowed the PI to answer questions about the survey and insure that the survey was completed as thoroughly and correctly as possible. In the end, 20 horse clubs reporting 1703 horses responded to the survey.

Demographics – Club Location and Establishment

Geographically, China can be divided into 7 regions. At least one response was submitted from each region: East China (n=6), North China (n=5), Northwest China (n=3), South China (n=2), and 1 each from Central, Southwest, and Northeast China (Figure 1). One club did not respond to the geographic question. While it initially may appear important that the majority of responses came from East and North China, it must again be noted that the relationship between the PI and some of the horse clubs contacted for participation in the study likely biased the distribution of responses. As such, more horse clubs from East China, the PI's home

province, responded to the survey. This data agrees with other published data, where the most clubs appear to be located in East and North China (Equestrian Magazine, 2019).

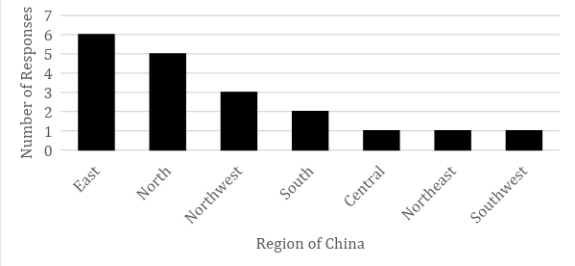


Figure 1. Number and location of respondents (n=19/20) to a survey on horse use and management in Chinese horse clubs.

In 2010, there were approximately 300 horse clubs in China (Li, 2013). Another survey reported 907 in 2016, 1452 in 2017, and 1802 horse clubs in China by 2018 (Horsemanship Magazine, 2018). In 2018, two of the seven regions held most of the horse clubs (61.80%): East China (n=599; 33.2%), and North China (n=531; 29.5%). In this survey, 6 horse clubs (30.0%) were from East China and 5 (25.0%) were from North China. These included 55.0% of the total respondents, which is similar to previously published survey data.

In China, public accounts (WeChat) and websites are among the most important ways of spreading information about a business. In a previously published survey, 74.1% of 109 selected horse clubs had their own WeChat public accounts, and 58.9% of another 86 selected horse clubs had their own websites (Horsemanship Magazine, 2018). In this survey, only 35% of respondents (n=7/20) had a WeChat public account or website (Table 2). The relatively short history of some of the horse clubs surveyed may be a reason for this gap. Additionally, clubs may not be inclined to invest in business promotion through such methods due to a lack of marketing awareness and a misconception of publicity and promotion importance (Shen et al., 2015). Due to the low cost, fast dissemination, and wide coverage of network propaganda, mass media tools should be fully utilized to promote the horse clubs (Yan et al., 2011).

Table 2. Use of WeChat public account or websites in Chinese horse clubs (n=20) in response to a survey on horse use and management.

Style	North	South	East	Central	Southwest	Northwest	Northeast
Public Number	0	1	1	0	0	3	0
Website	1	0	1	0	0	0	0

All horse clubs that responded to this survey were established between 2002 and 2018. Of the 20, 13 (65%) were founded between 2011 and 2018. Since 1985, when the first horse club was formed in Beijing (Yan et al., 2011), the number of horse clubs has grown. The appearance of a spike in the number of horse clubs established in 2012 and 2015 in the current data do not necessarily indicate two years with the highest rate of horse club establishment in China. As was acknowledged previously, the method of survey distribution and low response rate likely biased the data. However, even these responses imply rapid comprehensive growth of the Chinese horse industry since 2010.

Club Employees and Needed Skills

Horse clubs in China have been facing different levels of talent shortage in various positions such as coaches (to train riders and people), veterinarians, farriers, horse club managers, and stable workers (Yan et al., 2011; Zhang, 2019). In the

current survey, 7 skills were listed for respondents to choose from to indicate the most needed. While all 7 skills were chosen at least once, veterinary (23.8%), farrier (19.0%), and nutritionist (12.7%) were the top three (Figure 2). In China, there is no formal training available for veterinarians or farriers, and equine science education is in its infancy. Currently, college students can earn a bachelor's degree in Veterinary Medicine, but it consists almost completely of classroom education with little to no hands-on experience. Those skills are later learned as on-the-job training if, or when, the graduate begins to work with a more experienced veterinarian.

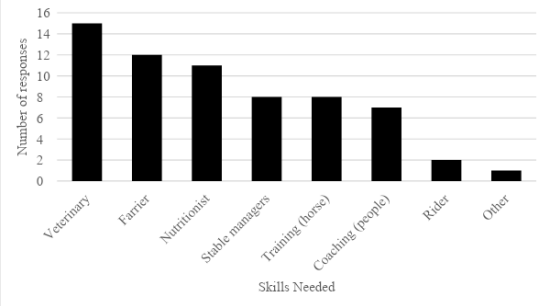


Figure 2. Skills most needed in horse clubs (n=20) in China responding to a survey on horse use and management.

The questionnaire also allowed horse clubs to list and explain other skills needed. One horse club reported needing people skilled in horse training, stable management, and nutrition, but indicated that they would like to see all those skills in one person. This suggests that they want people trained or experienced in general equine science, however, would attempt to hire as few people as possible to save money.

Six clubs did not respond to the question regarding the use of a farrier, while one club did not respond about employing veterinarians. Ten clubs did not respond regarding dentists, which is unsurprising given that this is not commonly thought of as an independent skill set – it is typically associated with a veterinarian. In this survey, full-time indicated people who were employed to work for that horse club in a full-time capacity. Part-time included employees that worked only part-time and may have worked at multiple clubs. Two clubs employed veterinarians both full-time and part-time, one of which also employed farriers both full-time and part-time. Horse clubs were more likely to employ dentists part-time if they denoted that as a separate skill (Table 3). In the current survey, 60% of responding horse clubs employed full-time veterinarians. This differs from other published lay research, where full-time veterinarians were only used in 29% of horse clubs of China (Horsemanship Magazine, 2018).

Table 3. Employment of veterinarians, farriers and dentists, full time (F) or part time (P) in Chinese horse clubs (n=20) responding to a survey on horse use and management.

	Employees					
	Veterinary		Farrier		Dentist	
	F	P	F	P	F	P
Number of responses	12	9	9	6	2	8
Percentage	60	45	45	35	10	40
Total F employees	23		Total P employees		23	

Two clubs from East China and two clubs from Northeast China indicated they had no employees holding certificates or diplomas associated with equine science. One club from Southwest China said 100% of its employees held such certificates or degrees, which is remarkable. In total, 80% (n=16/20 clubs) of clubs had some employees with certificates or degrees associated with equine science (Table 4). However, the average education level of coaches in some horse clubs in Shandong

and Jiangsu Provinces was very low; 92.1% of coaches had only graduated from middle school (An et al., 2012). In China, middle school encompasses youth aged 13-16 years. The limited education of some of these employees could hold back the development of their local horse industry (An et al., 2012).

Table 4. Riders with certificate or degrees associated with equine science in Chinese horse clubs (n=20) responding to a survey on horse use and management.

Max	Min	Average	<20%	20%-40%	40%-60%	60%-80%	80%-100%
			Number of clubs				
100%	0%	38.8%	3	2	4	4	3

Assuming a lack of education or experience in Chinese employees, a question was included to inquire about the hiring of foreign experts. Nearly 60% of foreign coaches were employed more than 12 mo (Table 5), and foreign employees were always hired for more technical or higher-skilled positions. While the Netherlands was the number one country China employed foreign coaches from between 2015 and 2017 (Horsemanship Magazine, 2018), the current survey found most coaches were from France, followed by the Netherlands (Figure 3). This disparity may have been an artifact of the sampling process and the limited response size of the current survey.

Table 5. Foreign employees in Chinese horse clubs (n=20) responding to a survey on horse use and management.

Time	<3 mon	3-6 mon	6-12 mon	>12 mon
Number of foreign employees	24	16	13	43
Percentage (%)	25.00	16.67	13.54	44.79

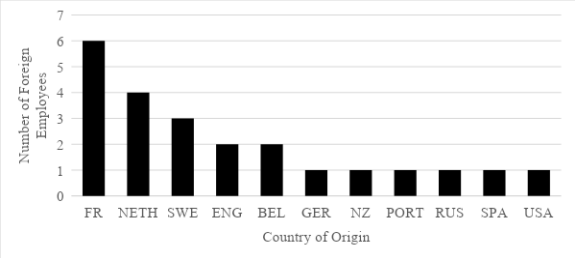


Figure 3. Nationality of foreign employees in Chinese horse clubs (n=20) responding to a survey on horse use and management.

Foreign employees were mainly responsible for teaching basic riding (42.9%), dressage (21.4%), or nutritional support (17.9%) (Figure 8), which were skills closely related to the previously mentioned skills most needed (Figure 4). It again suggests that Chinese equine industry professionals are not ready to directly handle the task of education and training in China.

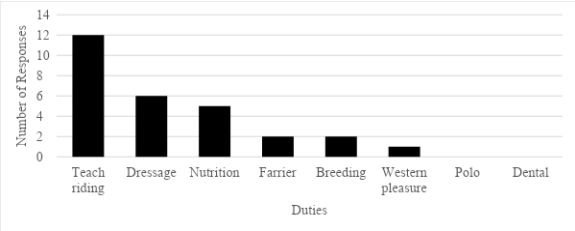


Figure 4. Duties of foreign employees in Chinese horse clubs (n=20) responding to a survey on horse use and management.

Demographics – Horse Data

Twelve horse clubs indicated that they had no horses over 20 yrs of age, while one horse club only had horses under 15 yrs of age, and yet another reported only having horses between 6–10 yrs of age. Two horse clubs had horses under 10 yrs of age. Horses under 15 yrs represented 84.6% of the total number of horses reported (Table 6).

Table 6. Number of horses and ages in horse clubs (n=20) responding to a survey on horse use and management in China.

Age	<5 years	6-10 years	11-15years	16-20 years	>20 years
Number	506	477	466	234	30
Percentage	29.54	27.85	27.20	13.66	1.75

In developed countries, the proportion of aged horses within the equine population appears to be increasing, due in part to improved health care and nutrition plus a change in the public perception and expectations regarding ageing horses (Ralston and Harris, 2013). Demographic old age has been defined as the point at which there is only 25% survivorship of the population at or above that specific age. One United Kingdom study found this age to be 15 yrs. The equine population was relatively stable until horses reached 15 yrs of age, after which there was a steady decline in numbers until there were very few horses over 35 yrs of age (Mellor et al., 1999). Another study showed that aged horses in Australia constituted a large subgroup of the national horse population; horses aged 15 yrs or greater represented one-third of the total horses owned in the population sample (McGowan et al., 2010). In the current survey, only 15.4% of 1703 horses were over 15 yrs.

In this survey, the top three imported horse breeds were warmbloods (WB), Thoroughbred (TB), and Arabian (Table 7). According to previous surveys, the top 5 imported horse breeds in China from 2015 to 2017 placed WB at the top of the list but did not include Arabians (Horsemanship Magazine, 2018; Equestrian Magazine, 2019). These results are not surprising, as WB have been selectively bred for conformational traits correlated with jumping skills and good dressage gait scores (Walters et al., 2008), factors the Chinese horse industry is looking for. The top three nations where horses were imported from between 2015 and 2017 included the Netherlands, New Zealand, and Australia (Horsemanship Magazine, 2018). Another survey noted that most horses were imported from the Netherlands and Germany (Equestrian Magazine, 2019). In the current survey, imported horses generally originated from the same countries.

Table 7. The most commonly imported horse breeds and origins in Chinese horse clubs (n=20) responding to a survey on horse use and management.

Horse	Number of clubs*	Percentage	Origin
Warmblood	12	30.00	Netherland, Belgium
Thoroughbred	7	17.50	Australia, Belgium, British, Irish
Arabian	6	15.00	Arabian
Friesian	3	7.50	Netherland
Akhal Teke	3	7.50	Arabian, Kazakhstan
Shetland	2	5.00	Netherland
Selle Francais	1	2.50	France
Orloff	1	2.50	Russia
Hannover	1	2.50	Germany
Andalusian	1	2.50	Lusitano
QH	1	2.50	America
Lusitano	1	2.50	Belgium
Budenny	1	2.50	Russia

* Total number of clubs may appear to be more than the number responding to the survey, as clubs could note more than one imported breed.

Three horse clubs did not respond to a question regarding indigenous horse breeds, and two indicated that they did not have Chinese horse breeds in their clubs. Mongolian and Yili horses were the two most commonly reported domestic breeds (Table 8). Domesticate horse breeds occupy about 25% of all the horse breeds of horse clubs in China, compared to 22% of TB and 18% of WB (Horsemanship Magazine, 2018).

Table 8. Distribution of Chinese horse breeds in Chinese horse clubs (n=15/20*) responding to a survey on horse use and management.

Horse breeds	Number of horse clubs	Percentage (%)
Mongolian	5	33.33
Yili	4	26.67
Sanhe	1	6.67
Baise pony	1	6.67
Xinan	1	6.67
Debao Pony (Miniature)	1	6.67
Dongbei	1	6.67
Yunnan	1	6.67
Total	15	100

*Three respondents did not answer this question and two indicated having none.

Horse Use

According to a previous survey, the top 5 growing uses of horses in China were likely to be as teaching horses, or as mounts for Western equestrian events, polo ponies, racing, and endurance (Horsemanship Magazine, 2018). However, results of the current survey suggested that horses were being used for recreation (20.45%), breeding (17.46%), teaching (15.46%), dressage (15.25%), and jumping (10.29%). Use for endurance events was only 1.6%, and use for barrel racing (a Western equestrian event) was only 1.2% (Figure 5). In the United States, the primary use of horses since the mid-1990s has been pleasure/recreation (Kilby, 2007; USDA, 2015). In Great Britain, a survey of horse owners showed that 56.7% of horses were used for pleasure, 12.8% as retired horses, and 11.7% for performance. It is obvious that horse use in the United States and Great Britain is primarily for recreation. While percentages are different, results from the current survey appear to follow the trend for horse use in recreation.

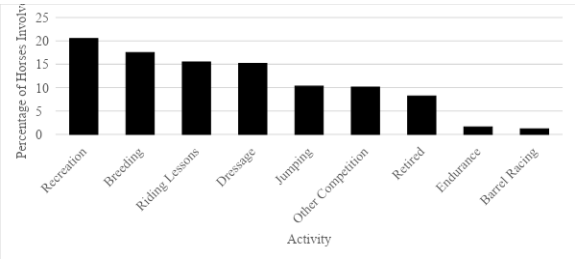


Figure 5. Use of horses in Chinese horse clubs (n=20) based on a survey of horse use and management.

In Chinese horse clubs, the horses are often owned by the club. Their use is dependent on the type of service offered by the club. Fourteen horse clubs provided membership service, which had to be purchased in order to utilize horses at the club. Twelve clubs offered services for visitors, some in conjunction with membership. Five horse clubs were not open to the public. One club said that they had 100,000 visitors in a year. This number was culled from the data set for being an extreme outlier. Previous information noted an average number of memberships was 303 people (Horsemanship Magazine, 2018), which was higher than the average value of 260 from our survey (Table 9).

Table 9. The number of customers served annually by Chinese horse clubs (n=14/20) responding to a survey on horse use and management.

	Number of clubs	Max	Min	Mean
Number of memberships	14	1000	40	260
Number of visitors	12	2000	200	667

Attendance of events is usually the objective of most competitive equestrians. In China, the three most popular equestrian events included jumping, three-day events, and dressage. These events usually happen from May to November (Horsemanship Magazine, 2018). In response to a question regarding

participation in equine events, 19 respondents indicated that most horse clubs took part in some events during the year, but the activity seemed low. One club responded with an ambiguous "hard to say", while three clubs gave a range. In the United Kingdom, the annual competition frequencies of all dressage horses were 6-10 times/yr (31%) and 11-15 times/ year (24%) (Walters, et al, 2008). However, over half of the Chinese horse clubs reported attending 0-5 events/yr (52.6%), suggesting a low efficiency of using horses for these events (Table 10).

Table 10. The number of events attended annually by Chinese horse clubs (n=14/20) responding to a survey on horse use and management.

Number of events/yr	Number of clubs	Percentage
0-5	10	52.6%
6-10 times	4	21.1%
>10	5	26.3%

Horses were used throughout the year around the country. However, equestrian leisure is affected by weather and season. Lower industry participation may occur on rainy days and during colder seasons (Yan et al., 2011). The results from the current survey supported this point of view. The period of highest use was from July to September (Figure 6). Participation was particularly high in August, which is a vacation month for all schools of China.

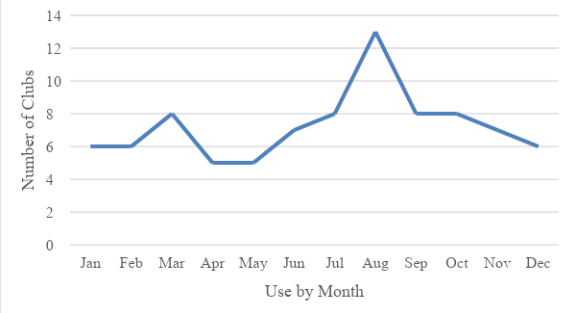


Figure 6. Monthly horse use in Chinese horse clubs (n=20) that responded to a survey on horse use and management.

An investigation on horse use in 9 universities and colleges with equine programs in the United States showed that horses were used from 0.5 to 12 hr/wk with a mean of 4 hr/wk per horse for all uses (Zhao et al., 2017). Compared to that, horses in this study were used for an average of 3 hr/wk per horse in 20 horse clubs of China. On average, horses were used 5 d/wk (Table 11).

Table 11. Horse use on a weekly and daily basis in Chinese horse clubs that responded to a survey on horse use and management.

	Days for uses in a week (d/wk)	Hours for uses in a day (h/d)
Average	5.18	3.13
Range	1-7	1-8
Number of clubs	17	16

The issue of overuse of animals in Chinese horse clubs has been raised previously (Zhang et al., 2008; Su et al., 2014). No data in the current survey were from horse clubs in the provinces with documented overuse (Zhang et al., 2008; Su et al., 2014), so it is unknown whether horse clubs in those areas track horse use. In the current study, three horse clubs used a combination of daily logs, verbal communication and had a single person in charge of horse use. Four clubs used a combination of daily logs and a single person in charge. Five clubs used only daily logs. Four horse clubs used only a single person in charge. Finally, one horse club used only verbal communication. Interestingly, three clubs claimed that no such situation (overuse of horses) existed. In comparison, a survey of university horse use reported that 3 of 9 programs used a combination of daily logs and verbal communication (Zhao et al., 2017). The results of the current survey were encouraging, as it seems to suggest most horse clubs were using some sort of tracking system.

Equine Feeding

Nutrition is an important aspect of health care in all species. In horses, a diet that is formulated improperly can contribute to several diseases or conditions, including colic, orthopedic problems, and obesity. Formulating a properly balanced ration for horses can be difficult because it must be developed from multiple components (e.g., forage, concentrates, and possibly supplements), and it must take into account the activity level, life stage, and individual variation (Hoffman et al., 2009). A survey in New England suggested that all horse owners reported feeding hay, with the majority feeding grass hay (Hoffman et al., 2009). In Great Britain, the majority of horses had exposure to grass (i.e. grazing) during the year, and 69.3% were also supplemented with hay (Hotchkiss et al., 2007). A survey of a global population of horse owners suggested that more than 70% of respondents stated that their horses had some access to pasture (Murray et al., 2015). In the current survey, 18 respondents indicated that they fed horses hay, but only one noted that horses also had access to pasture. Thirteen responses included weight values in response to the question of how much forage was fed to each horse daily and numeric responses to the question of how often forages were fed (Table 12). Three responses were vague ("It depends", "Free take", or "Sufficient"), three did not specify an amount or frequency fed, and one combined all feed (forages, concentrate, and supplements) in one response. These were dropped from consideration. The minimum amount of forage recommended for horses each day is 1% of their body weight, which would be approximately 5 kg/d for the average 500 kg horse. Only 3 of the 13 respondents who indicated the amount of forage fed were less than 7.5 kg/d, suggesting that most horses accounted for in this survey were getting an adequate forage. It is also recommended that horses have access to forage most of the day, or that feedings be as frequent as possible. Anatomically, the equine digestive tract is designed to accommodate small meals over the course of 24 hr. It is common to feed horses 2-3 times/d. in Western countries the lowest frequency of feeding reported in this survey was 3 times/d, which is in line with practices in other countries.

Table 12. Forage fed and feeding frequency for horses in Chinese horse clubs (n=13/20) responding to a survey on horse use and management.

Forage volume for each horse (kg/d)		Frequency of feeding (times/head/d)		
Max	Min	Max	Min	Mean
20	3	6	3	4

Questions involving feeding of concentrates (grain mixes) resulted in mixed responses. Only nine respondents answered all three parts of the question fully. Six respondents did not answer the question at all. Five responses were unclear and were not included in the evaluation. It is possible that those who did not respond or were unclear in their answers do not feed horses concentrates. If that is the case, then this data would not be in line with previously published surveys. A study of horse owners in New England revealed that 96% of horse owners reported feeding a concentrate in addition to hay (Hoffman et al., 2009). Another global survey reported that 87% of respondents fed concentrates (Murray et al., 2015).

Best feeding practices for horses agree that forages should be the basis of the diet. Also, concentrates should be fed

at as low a level as possible and should comprise no more than 50% of the diet (Evans and McKendrick, 2000). Exercising horses often requires more concentrate in their diet in order to increase nutrient density to meet increased nutrient needs (Ensminger, 1990). Total feed intake/d is estimated to be 2.5% of the horse's body weight. As such, the maximum amount of concentrate that should be fed to a 500 kg horse is 6.25 kg/d. In the current survey, most horses were used for some type of exercise (Figure 5). The maximum amount of concentrate being fed was 6 kg/d, and feeding frequency of concentrates was 2-3 times a day (Table 13). Again, these feeding practices are in line with those commonly accepted in Western countries.

Table 13. Concentrate types and feeding frequency for horses in Chinese horse clubs (n=9/20) responding to a survey on horse use and management.

Concentrate type	Amount per horse/d	Frequency per horse/
Processed feeds	2-6 kg	2
Cereal	It depends	2
Self-made	about 3 kg	3
Red Ram (brand)	It depends	3
Knight (brand)	6 kg	3
Protein feeds	0.3 kg	2
Red Ram	5 kg	2
Self-made	It depends body weight	2
Mixed with Red Ram and self-made cereal feeds	2-3 kg	3

In many countries, a variety of supplements are often added to the diets of humans and animals in order to have various effects. The more commonly accepted supplements range from broad-spectrum vitamin/mineral supplements to those providing one or a selected few specific nutrients, herbs, or those designed to impact specific areas of the body (bones and joints, gastrointestinal, etc.). Supplemental addition of vegetable oil as an alternative energy source is commonly practiced with horses (Harris, 1997). In a survey of feeding practices, dietary supplement use, and knowledge about equine nutrition in New England, approximately 84% of owners reported including at least one dietary supplement in their horse's daily feeding. The most commonly used supplements were chondroprotectives (joint supplements), electrolytes, and multivitamins (Hoffman et al., 2009). In the United States, most horse owners indicated a belief in supplement safety and efficacy and were using supplements to treat or prevent the issues they perceived their horses to have (Swirsley et al., 2017). In the current survey, a list of common supplements was given for respondents to select from, and a category for "Other" was included. Minerals, vitamins, oils, yeasts, salts, electrolytes, and bone powder were reported by 14 respondents. Only 7 gave the reasons for using supplements, but most of those reasons were unclear. "Cheap and safe" was one response. Another included "nutrition". There is evidence to suggest that many horse owners have a poor understanding of equine nutrition (Hoffman et al., 2009), and decisions regarding nutritional management are often based on tradition, folklore, and misinformation (Roberts and Murray, 2013). It is possible that respondents in this study were not sure why these supplements were being fed.

Equine Management

One club did not respond to the question regarding paddocks and turnout space. Four horse clubs indicated that they had no paddocks for turnout. Five horse clubs reported paddocks with grass, with sizes ranging from 50-10000 m^2. The final 15 clubs had paddocks without grass, ranging from 200-30000 m^2 (Table 14). Some horse clubs (n=4) had both paddocks with and without grass.

Table 14. Number and size of paddocks with or without grass in Chinese horse clubs (n=15/20) responding to a survey on horse use and management.

	Paddocks with grass	Paddocks without grass
Number of horse clubs*	5	15
Range (m^2)	50-10000	200-30000
Range (acres)	0.08-15	0.30-45

*The total number of clubs reported includes those with both paddocks with and without grass. One respondent did not answer the question and four indicated they had no paddocks.

Two horse clubs did not respond to questions regarding turn out time available for horses. One respondent answered zero. Of the other 17 horse clubs, average turn out time was 2.7 hr/d and 5.5 d/wk (Table 15).

Table 15. Turn out time in Chinese horse clubs (n=18/20) responding to a survey on horse use and management.

Turnout	Min	Max	Average
Hours per day	0	6	2.67
Days per week	0	7	5.53

It is commonly accepted that turnout space for free exercise is important to equine welfare, and both size of the turnout space and time turned out are important. Research investigating the effect of exercise (no exercise/daily exercise) and paddock size (small: 150 m^2, medium: 300 m^2, and large: 450 m^2) on horse behavior suggested that increasing paddock size increased time spent eating grass and decreased time spent standing passively (Jorgensen and Boe, 2007). Larger turnout spaces have been shown to reduce stress responses during short periods of group turnout (Suagee-Bedore et al., 2017), and even "weekend" turnout could maintain bone mineral content (Spooner et al., 2014). Large pasture turnout helped maintain bone strength and exercise fitness ability for mature horses (Graham et al., 2013). Additionally, the behavior of stabled horses was more relaxed when turnout was allowed in addition to training. Behavior during training was also more relaxed, and a horse's willingness to perform was not negatively affected by turnout (Werhahn et al., 2011).

It is difficult to say how much turnout is best. For example, in a study on the relationship between time spent in turnout and behavior during turnout in horses, results showed that horses turned out for 2 hr/wk were more likely to trot, canter, and buck during turnout than those turned out for 12 hr/wk (Chaya et al., 2006). Another study demonstrated that either pasture raising or 12-h daily turnout was beneficial to maintaining and increasing bone mineral content in weanling Arabian horses (Bell et al., 2001). In the United Kingdom, turnout time per week for dressage horses showed that 2% had no turnout while 9% had over 90 h a week and 3% were out "all the time". Most horses were turned out from 15 to 60 hr/wk (Walters et al., 2008). Another survey showed that 58% of horses in Great Britain were turned out 24 hr/d (Mellor et al., 2001). Based on current research, it can be assumed that most of the horse clubs responding to the current survey used turnout effectively to manage their horses. The concern rests with those that reported having no turnout space at all; as such, those horse clubs with little or no turnout space may have to address equine welfare in other ways.

Abnormal stresses can cause a horse's hooves to wear unevenly or rapidly, requiring that those horses wear shoes. Horses' hooves can become quite worn when subjected to the added weight and stress of a rider, pack load, cart, or wagon (Ensminger, 1990). Long gaps between shoeing, or turning out a horse with untrimmed feet can result in detrimental outcomes. A good foot is one

of the determining factors in the ability of the animal to stay sound and perform well (Bromiley, 2007). Sometimes a good hoof requires shoes for performance requirements and staying sound. Relative to hoof care, all respondents had a mix of horses that fell into the categories provided. Fourteen respondents had horses without shoes, 12 had horses with only front shoes, and 12 had horses with front and rear shoes (Table 16). In a survey on management and training practice of UK dressage horses, 96% were shod in some way. Of those that were shod, 91% had shoes on both front and hind feet, 8% on the front feet only, and 1% on the hind feet only (Walters et al., 2008). Compared to the results of the survey mentioned above, one horse clubs in this survey showed a much larger shoeing percentage of front feet only (100%). That particular respondent had only 12 horses used for lessons and recreation. In China, due to the shortage of qualified professional farriers, inadequate shoeing may be another cause of hoof problems observed widely around the country (Figure 7).

Table 16. Horse shoe use in Chinese horse clubs (n=16/20) responding to a survey on horse use and management.

	No shoes	Front shoes only	Front and rear sho
Max	99%	100%	90%
Min	0	4%	0
Number of responses	14	12	12

In the United States, the top three destinations of departed animals on surveyed operations were ranked as sold to a private party, moved to another facility, and sold at public auction. The top three reasons for permanent removal of horses from resident operations were business profit, situation change (e.g., owner, children moved, owner illness), and temperament problem (Kilby, 2007). Generally, sales appear to be the most common reason for a horse to leave an operation. In the current survey, the most common reason for a horse to leave a club was to be sold (Table 17). However, there was no indication of the reason for the sale. It is possible that some horses were sold for the reasons listed in the Other category.

Table 17. Reasons for horses leaving Chinese horse clubs (n=20) responding to a survey on horse use and management.

Reason	Number of clubs	Percentage
Sold	7	43.75
Disease	2	12.5
Other	7	43.75

Other category included Owner Left, Unable to Compete, Retired, Death, Not Needed, Moved to Another Location, or No Medical Response, each listed once

Equine Health Issues

Equine health and welfare is an important topic, and one of particular interest when an industry grows as rapidly as the equine industry has in China's recent past. Four health issues common in Western countries were offered as options. Nineteen respondents answered the question. All choices were selected at least once, but the top two were hoof issues (31.6%) and injuries (31.6%) (Figure 7). Although "Other" was offered as an option, no club selected this or expanded on the issues selected.

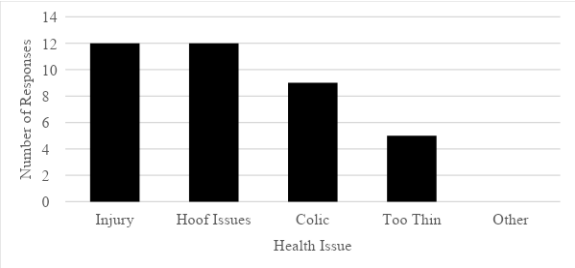


Figure 7. Major equine health problems experienced in Chinese horse clubs (n=19/20) responding to a survey on horse use and management.

In the United States, reports have documented that the top three equine health conditions were digestive/diet-related problems such as colic, injury/wounds/trauma, and leg/hoof problems (Kilby, 2007; USDA, 1998). Interestingly, colic was ranked third in this study. An investigation into health issues in Yili horses in northwest China showed that the incidence of medical disease, including injuries and colic, was 41.4%; surgical and obstetrical diseases was 38.4%; and infectious diseases and parasite infection was 20.2%. Improper feeding, management, and use of horses were the principle reasons given (Su et al., 2014). Another investigation on epidemics of various diseases in horse clubs of Henan Province located in the central region of China showed that the incidence of medical disease, surgical and obstetrical diseases, and infectious diseases and parasites infection were 44.8%, 40.2%, and 11.5%, respectively. The main reasons given for the incidence of these conditions were again improper feeding and management, and overuse, but also included poor adaptability of introduced TB horses, half TB horses, and some hybrid horses (Zhang et al., 2008). The current survey did not ask for the causes of health problems; however, the incidence of hoof issues and injury suggest that horse management and use may be less than optimal.

Conclusion

This assessment of horse use and management in Chinese horse clubs provided a limited but interesting insight into the status of the Chinese horse industry. International communication and cooperation are bringing foreign breeds of horses, which likely improve the Chinese horse industry but may be depressing the use of domestic horse breeds. As the industry grows, caution should be taken to not lose sight of this aspect of Chinese history and culture. The inclusion of foreign experts for several subject areas also likely helps support the Chinese horse industry, but efforts to train Chinese horse club managers and employees should be strengthened as well.

Results from this survey suggest that many Chinese horse clubs lack knowledge in equine science and management practices that are more common in Western countries. Clear knowledge of best management practices was often not reflected in responses. Specifically, veterinary skills, nutrition, and farrier support are needed to improve horse care. Again, while these areas could be addressed by bringing in foreign experts, education and training programs in China should be strengthened to better support this growing industry.

Referenced Materials

An, X.G. & Cao, J.C. (2012). huái hǎi jīng jì qū mǎ shù jù lè bù xiàn zhuàng diào chá yǔ fā zhǎn duì cè yán jiū [Investigation on the current situation of equestrian clubs in Huaihai economic zone and the countermeasures for their development] Sports yùn dòng 53, 125-126.

Bell, R.A, Nielsen, B.D., Waite, K., Rosenstein, D. & Orth, M. (2001). Daily access to pasture turnout prevents loss of minerals in the third metacarpus of Arabian weanlings. *Journal of Animal Science*, 79(5), 1142-1150. https://doi.org/10.2527/2001.7951142x.

Chaya, L., Cowan, E. & McGuire, B.A. (2006). A note on the relationship between times spent in turnout and behavior during turnout in horses (Equus caballus). *Applied Animal Behavior Science*, 98(1-2), 155-160. https://doi.org/10.1016/j.applanim.2005.08.020.

Dillman, D.A., Smyth, J.D. & Christian, L.M. Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method. 4th ed. Hoboken, NJ: John Wiley and Sons, Inc.

Equestrian Magazine. (2019). 2019 China Equestrian Industry Development Status Survey Report. http://www.horsing.org/article-3742-1.html. August 10, 2020.

Evans, P. & McKendrick, S. (2000). Equine nutrition: Concentrates. https://extension.usu.edu/equine/files-ou/Equine-Nutrition-Concentrates.pdf.

Kilby, E.R. (2007). The demographics of the U.S. equine population. In D.J. Salem & A.N. Rowan (Eds.). The State of the Animals 2007 (pp. 175-205). Washington, DC: Humane Society Press.

Ensminger, M.E. (1990). Horses and horsemanship: Animal agriculture series. Sixth Edition. Interstate Publishers, 367–371.

Graham-Thiers, P.M. & Bowen, K.L. (2013). Improved ability to maintain fitness in horses during large pasture turnout. *Journal of Equine Veterinary Science*, 33(8), 581-585. https://doi.org/10.1016/j.jevs.2012.09.001

Harris, P. (1997). Energy sources and requirements of the exercising horse. *Annual Review of Nutrition*, 171(1), 185-210. https://doi.org/10.1146/annurev.nutr.17.1.185

Hoffman, C.J., Costa, L.R. & Freeman, L.M. (2009). Survey of feeding practices, supplement use, and knowledge of equine nutrition among a subpopulation of horse owners in New England. *Journal of Equine Veterinary Science*, 29(10), 719-726. https://doi.org/10.1016/j.jevs.2009.08.005

Horsemanship Magazine. 2018. Annual report: state of Chinese equestrian industry development. https://pmu.cn/13035/. Accessed April 2, 2019.

Hotchkiss, J.W., Reid, S.W.J. & Christley, R.M. (2007). A survey of horse owners in Great Britain regarding horses in their care. Part 1: Horse demographic characteristics and management. *Equine Veterinary Journal*, 39(4), 294-300. https://doi.org/10.2746/042516407X177538

Jørgensen, G.H. & Bøe, K.E. (2007). A note on the effect of daily exercise and paddock size on the behavior of domestic horses (Equus caballus). *Applied Animal Behaviour Science*, 107(1-2), 166-173. https://doi.org/10.1016/j.applanim.2006.09.025

Mang, L. (2016). zhōng guó mǎ yè zhǔ chǎn qū mǎ chǎn yè dí fā zhǎn qū shì [Developmental trends of horse industry in major horse production areas in China.] Xinjiang animal husbandry xīn jiāng xù mù yè 9, 42-49

Bromiley, M.W. (2007). Equine injury, therapy and rehabilitation. Third Edition. Blackwell Publishing Ltd. https://doi.org/10.1111/j.1751-0813.1994.tb03464.x

McGowan, T.W., Pinchbeck, G., Phillips, C.J.C., Perkins, N., Hodgson, D.R. & McGowan, C.M. (2010). A survey of aged horses in Queensland, Australia. Part 1: Management and preventive health care: Equine. *Australian Veterinary Journal*, 88(11), 420-427. https://doi.org/10.1111/j.1751-0813.2010.00638.x

Mellor, D.J., Love, S., Gettinby, G. & Reid, S.W. (1999). Demographic characteristics of the equine population of northern Britain. *Veterinary Research*. 145, 299-300. http://dx.doi.org/10.1136/vr.145.11.299

Mellor, D.J., Love, S., Walker, R., Gettinby, G. & Reid, S.W.J. (2001) Sentinel practice-based survey of the management and health of horses in northern Britain. *Veterinary Research*, 149, 417-423. http://dx.doi.org/10.1136/vr.149.14.417

Qiao, Y. (2016). wǒ guó mǎ shù jù lè bù fā zhǎn xiàn zhuàng fēn xī jí xiāng guān cè luè yán jiū [Investigation on developmental status of horse clubs of China and strategies.] Modern Business xiàn dài shāng yè 9, 171-172.

Ralston, S.L. & Harris, P.A. (2013). Nutritional considerations for aged horses. In: Equine Applied and Clinical Nutrition, Eds: R.J. Geor, P.A. Harris and M. Coenen, W.B. Saunders, Philadelphia. 289-303. https://doi.org/10.1016/B978-0-7020-3422-0.00015-8

Roberts, J.L. & Murray J-A.M.D. (2013). Survey of equine nutrition: perceptions and practices of veterinarians in Georgia, USA. *Journal of Equine Veterinary Science,* 33, 454–459. https://doi.org/10.1016/j.jevs.2012.08.001

Shen, Z., Weng, X.J. & He, J.D. (2015). jiāng yīn shì hǎi lán guó jì mǎ shù jù lè bù yán jiū [Research on Hailan International Equestrian Club in Jiangyin city.] Sports Culture Guide tǐ yù wén huà dǎo kān, 11,121-125.

Spooner, H., Hoffman, R. & Haffner, J. (2014). Can stalled horses provided light exercise and "weekend" turnout maintain bone mineral content? *Equine Veterinary Journal*, 46, supplement S46, 29-30.

Su, W., Ai, S.J., Suo, Y.L., Li, J. Li, Q. Y. & Wang, Y.M. (2014). yī lí mǎ jí bìng diào chá yǔ bìng yīn qiǎn xī [A primary investigation on the diseases affecting Yili horses.] Animal Husbandry＆Veterinary Medicine xù mù yǔ shòu yī , 46(11), 135-136.

Sun, D. Z. & Xu, J. (2013). zhōng guó mǎ shù yùn dòng fā zhǎn miàn lín dí wèn tí jí lù jìng xuǎn zé [The problems of the Chinese equestrian sports and path selection.] Shandong Sports Science & Technology shān dōng tǐ yù kē jì, 35(4),10-14.

Swirsley, N., Spooner, H., and Hoffman, R. (2017). Supplement use and perceptions: A study of US horse owners. *Journal of Equine Veterinary Science,* 59, 34–39. https://doi.org/10.1016/j.jevs.2017.08.021

United States Department of Agriculture. 2015. Demographics of the U.S. equine population, 2015. https://www.aphis.usda.gov/animal_health/nahms/equine/downloads/equine15/Equine15_is_Demographics.pdf.

van Moorsel, L.J. (2010). An overview of Chinese equestrian industry. https://issuu.com/worldhorsesport/docs/an-overview-of-chinas-equestrian-industry.

Vörgers, M. (2017). Safety standards in the Chinese equestrian industry --The gap between the industries safety standards of the West vs. China. https://essay.utwente.nl/71347/1/Vorgers_BA_IBA%202016.pdf.

Walters, J. M., Parkin, T., Snart, H. A. & Murray, R. C. (2008). Current management and training practices for UK dressage horses. *Comparative Exercise Physiology*, 5(2), 73-83. doi:10.1017/S1478061508017040

Wang, B. (2007). shì lùn mǎ zài gǔ dài zhàn zhēng zhōng dí zuò yòng [The horse use in wars in ancient China.] Heilongjiang Historical Records hēi lóng jiāng shǐ zhì, 4, 58-59.

Wang, T.Q. (2006). rèn shí zhōng guó xiàn dài mǎ yè xīn fā zhǎn [The new development of China modern horse industry during 1949-2005.] *Chinese Herbivores zhōng guó cǎo shí dòng wù, pp.* 55-56.

Werhahn, H., Hessel, E.F., Schulze, H. & Van Den, W. & Herman, F.A. (2011). Temporary turnout for free exercise in groups: effects on the behavior of competition horses housed in single stalls. *Journal of Equine Veterinary Science*, 31(7), 417-425. https://doi.org/10.1016/j.jevs.2011.01.006

Yan, T., Shen, S. W. & Tu, R.X. (2011). zhōng guó mǎ shù jù lè bù shí zhèng yán jiū [An empirical research on the equestrian clubs in China.] Journal of Huzhou Teachers College *hú zhōu shī fàn xué yuàn* xué bào, 33(2), 95-100.

Yao, X.K., Ouyang, W., Tan, X.H. & Tang, L.Z. (2007). xīn jiāng tè sè mǎ chǎn yè tàn xī [Exploration on featured horse industry in Xinjiang.] Xinjiang Agricultural Sciences xīn jiāng nóng yè kē xué, 44 (2), 199-205.

Zhang, Y. (2019). Becoming a reflexive researcher through a critical evaluation into the health and welfare implications into importing horses into China. Master's Thesis, The University of Gloucestershire.

Zhang, H., Cui, Y.M. & Zhang, C. H. (2008) diào chá yǔ bìng yīn qiǎn xī [Investigation of epidemics of various diseases in horse clubs of Henan Province.] Journal of Zhengzhou College of Animal H usbandry Engineering zhèng zhōu mù yè gōng chéng gāo děng zhuān kē xué xiào xué bào, 28(2), 16-18.

Zhao, H., Splan, R.k., Davis, A.J. & Porr, C.A.S. (2017). Horse use in higher education university equine programs: A pilot study. *Journal of Equine Veterinary Science*, 52, 114-126. https://doi.org/10.1016/j.jevs.2017.03.191